4 PHYSICAL EXAMINATION & CLASSIFICATION OF FIRED SHOTSHELL EVIDENCE

4.1 Introduction

The initial examination of any evidence shotshell cases will include the completion of a worksheet. These worksheets will include the physical description of the shotshell case and will serve as a source to document the condition of the evidence as received and any tests or comparisons performed.

By examining wadding, the examiner may be able to determine the gauge size, manufacture, and if the wad contains markings suitable for comparison with the firearm that fired it.

By examining recovered shot pellets, the examiner may be able to determine the actual shot size. The determined size can then be compared to the shot size loaded in submitted shotshells or to the size that the submitted shotshell case was marked to have contained.

4.2 Safety Considerations

Examinations performed in the Firearm and Toolmark Section are inherently hazardous. These procedures involve hazardous chemicals, firearms, ammunition, and power tools. All hazardous procedures must be performed in compliance with the DFS Safety Manual.

4.3 Preparation of Cleaning Solutions

NOTE: ALWAYS ADD ACID TO WATER. NEVER ADD WATER TO ACID.

4.3.1 Acetic Acid Solution

- Prepare a 15% Acetic Acid Solution by adding 150 milliliters of Glacial Acetic Acid to 850 milliliters of distilled water
- Store solution in an appropriate, sealed container that is marked with the date and initials of the preparer
- Record in the Firearms Quality Record Book

4.3.2 Bleach Solution

- Prepare a Bleach Solution by combining 10 milliliters of bleach to 90 milliliters of distilled water
- Store solution in an appropriate, sealed container that is marked with the date and initials of the preparer
- Record in the Firearms Quality Record Book

4.4 Instrumentation

- Comparison Microscope
- Stereo Microscope
- Micrometer/Caliper
- Ruler
- Scale/Balance

4.5 Minimum Analytical Standards and Controls

Appendix A

4.6 Procedure or Analysis

The evidence will be marked in accordance with the Quality Manual. A systematic approach should be used for the physical examination and classification of fired shotshell cases, with recording of findings and observations in the notes.

4.6.1 Shotshell Cases

Examination of shotshell cases should include general, visual, physical, and trace examinations, gauge determination, and marks determination.

4.6.1.1 General, Visual, Physical, and Trace Examinations

The initial examination of any shotshell case will include a worksheet. This worksheet will serve as a source to document the condition of the evidence as received. Further information will be added to the worksheet as tests are performed.

Examine the shotshell case visually and microscopically for any material. Determine if further examination of the material is necessary and consult the appropriate section prior to the removal of any trace evidence. Document findings and observations and record in notes.

Once the shotshell case has been examined for the presence of pertinent material, visual and physical examinations are conducted to determine the following features, to be documented on the worksheet:

- Any material present
- Shape of shotshell
- Gauge
- Possible manufacturer/marketer of the shotshell case
- Ignition system – centerfire
- Description of metal used in hull and primer
- Description of headstamp
- Description of firing pin impression

4.6.1.2 Trace Material Examination

Evidence recovered during an investigation may contain trace material transferred from the crime scene. This material may be in the form of blood, tissue, plaster, paint, hairs, fibers, glass, etc. The examiner needs to evaluate the importance of this material, and if further examination of the material is necessary, remove and preserve a sample of the material. Removal of the material may also be necessary to allow the proper examination of the evidence.

- Remove material being careful not to damage the evidence
- Place the removed material into a suitable container/packaging for possible submission to the appropriate section for further examination
- Record findings and observations in notes

If the trace material IS NOT going to be retained for further examination, proceed with the following:

- For evidence containing blood, tissue, or other biohazards, soak or sonicate the evidence for at least one (1) minute in a Bleach Solution (refer to 4.3)
- Remove loosened material by rinsing with methanol or water
- Remove plaster by soaking in a 15% Acetic Acid Solution (refer to 4.3)

- Remove paint by soaking in alcohol or acetone
- Use a non-abrasive brush to remove loose material
- Use Naval Jelly™ or E-zest™ coin cleaner to removed dark stains as needed
- Record findings and observations in examiner's notes

4.6.1.3 Shotshell Case Gauge Determination

Gauge can usually be determined by examination of the headstamp of the shotshell case. If it is not legible on the headstamp, the shotshell case can be compared with laboratory standards or available manufacturer literature.

4.6.1.4 Determination of Marks

Visual and microscopic examination of the shotshell case may reveal a variety of markings. Types of marks that might be found may be as follows:

- Breech face class marks
- Extractor marks
- Ejector marks
- Resizing marks
- Chamber marks
- Anvil marks (rimfire only)
- Magazine marks
- Ejection port marks
- Markings on the exterior surface of hull
- Other marks

As appropriate, compare marks on shotshell case with tests from a firearm or with other shotshell cases (see Section 5).

4.6.1.5 Interpretation of Results

- May determine gauge and brand/manufacturer/marketer of shotshell case
- May determine if there are suitable markings for identification with a firearm or with other fired components
- May determine possible firearms that could have fired shotshell case
- May be able to identify the firearm in which it was fired
- Record findings and observations in notes

4.6.2 Wads

Examination of wads should include general, visual, physical, and trace examinations, gauge determination, and marks determination.

4.6.2.1 General, Visual, Physical, and Trace Examinations

The initial examination of any wad will include a worksheet. This worksheet will serve as a source to document the condition of the evidence as received. Further information will be added to the worksheet as tests are performed.

Examine the wad visually and microscopically for any trace material. Determine if further examination of the material is necessary and consult the appropriate section prior to the removal. Document findings and observations in notes.

Once the wad has been examined for the presence of pertinent trace evidence material, visual and physical examinations are conducted to determine the following features, to be documented on the worksheet:

- Any material present
- Shape of wad
- Gauge
- Possible manufacturer/marketer of the item
- Description of wad composition

4.6.2.2 Trace Material Examination

Evidence recovered during an investigation may contain trace material transferred from the crime scene. This material may be in the form of blood, tissue, plaster, paint, hairs, fibers, glass, etc. The examiner needs to evaluate the importance of this material, and if further examination of the material is necessary, remove and preserve a sample of the material. Removal of the material may also be necessary to allow the proper examination of the evidence.

- Remove material being careful not to damage the evidence
- Place the removed material into a suitable container/packaging for possible submission to the appropriate section for further examination
- Record findings and observations in notes

If the trace material IS NOT going to be retained for further examination, proceed with the following:

- For evidence containing blood, tissue, or other biohazards, soak or sonicate the evidence for at least one (1) minute in a Bleach Solution (refer to 4.3)
- Remove loosened material by rinsing with methanol or water
- Remove plaster by soaking in a 15% Acetic Acid Solution (refer to 4.3)
- Remove paint by soaking in alcohol or acetone
- Use a non-abrasive brush to remove loose material
- Use Naval Jelly™ or E-zest™ coin cleaner to removed dark stains as needed
- Record findings and observations in notes

4.6.2.3 Wad Gauge Determination

Gauge can usually be determined by measuring the diameter of the wad and comparing with laboratory standards or available manufacturer's literature.

- Direct comparison of the evidence wad to known laboratory references of similar manufacturers in the composition, design, and diameter, which can assist in the determination of gauge size
- Gauge size can also be determined by measuring the base diameter of the wad and comparing the measurement to known wad-reference measurements
- Manufacturer data can be determined by locating information stamped into the wad or by comparing the evidence wad to known laboratory references

4.6.2.4 Determination of Marks

Visual and microscopic examination of the wad may reveal a variety of markings. Microscopic examination of the evidence wad could reveal markings that may be suitable for identification with the shotgun that fired it. If evidence shotshells are submitted with the evidence wad, it may be necessary to disassemble one of the shotshells for a comparison of the unfired wad with the evidence wad. Record the relevant information on the appropriate worksheet.

4.6.2.5 Interpretation of Results

The above-mentioned procedure is based on the assumption that the evidence wad submitted has sufficient material available to determine the possible manufacturer and the gauge size. If the wad is mutilated or soaked with blood or other body fluids, the examiner may not be able to specifically determine gauge size. The examiner also recognizes that some manufacturers might duplicate the design of other manufacturers. Record interpretation of results in notes.

4.6.3 Pellets

4.6.3.1 General, Visual, Physical, and Trace Examinations

The initial examination of any pellets will include a worksheet. This worksheet will serve as a source to document the condition of the evidence as received. Further information will be added to the worksheet as tests are performed.

Examine the pellets visually and microscopically for any trace material. Determine if further examination of the material is necessary and consult the appropriate section prior to the removal of the material. Record findings and observations in the notes.

Once the pellets have been examined for the presence of pertinent trace evidence material, visual, microscopic, and physical examinations are conducted to determine the following features, to be documented on the worksheet:

- Determine the total number of pellets received
- Determine the composition of the pellets
- Determine the number of pellets suitable for comparison purposes
- Note if pellet sizes all appear to be similar - if different sizes, determine each specific size
- Compare evidence pellets to laboratory references of known shot sizes side by side until a known shot size is determined. A stereo microscope may aid in this determination. This can be done one size at a time or several sizes at a time; however, if more than one size is used at a time, care should be taken not to mix up the shot.
- Record findings and observations in notes

4.6.3.2 Trace Material Examination

Evidence recovered during an investigation may contain trace material transferred from the crime scene. This material may be in the form of blood, tissue, plaster, paint, hairs, fibers, glass, etc. The examiner needs to evaluate the importance of this material, and if further examination of the material is necessary, remove and preserve a sample of the material. Removal of material may also be necessary to allow the proper examination of the evidence.

- Remove material being careful not to damage the evidence

- Place the removed material into a suitable container/packaging for possible submission to the appropriate section for further examination
- Record findings and observations in notes

If the trace material IS NOT going to be retained for further examination, proceed with the following:

- For evidence containing blood, tissue, or other biohazards, soak or sonicate the evidence for at least one (1) minute in a Bleach Solution (refer to 4.3)
- Remove loosened material by rinsing with methanol or water
- Remove plaster by soaking in a 15% Acetic Acid Solution (refer to 4.3)
- Remove paint by soaking in alcohol or acetone
- Use a non-abrasive brush to remove loose material
- Use Naval Jelly™ or E-zest™ coin cleaner to removed dark stains as needed
- Record findings and observations in notes

4.6.3.3 Comparison by Weight

- Determine the total number of pellets received
- Determine the composition of the pellets
- Determine the number of pellets suitable for weighing
- Make note if pellet sizes all appear similar
- If several sizes are present, determine each specific size
- Weigh the pellets in grains or ounces
- Divide weight of pellets by total number weighed
- Consult known pellet weights in NRA Handbook, Table 1 of Appendix G of the AFTE Glossary, 3rd ed., or manufacturer's data and determine shot size, which corresponds to evidence shot
- The weight of the evidence pellets can also be directly compared to weight of references using the same number of pellets until a similar known weight is obtained
- Record findings and observations in notes

4.6.3.4 Measuring Pellet Size

- Determine the total number of pellets received
- Determine the composition of the pellets
- Determine the number of pellets suitable for comparison purposes
- Make note if pellet sizes all appear to be similar
- If several different sizes are present, determine each specific size
- Choose the best specimen and measure diameter using a micrometer/caliper and record in hundredths or thousandths of an inch
- Consult known pellet sizes in NRA Handbook, Table 1 of Appendix G of the AFTE Glossary, 3rd ed. or manufacturer data and determine shot size, which corresponds to evidence shot
- Record findings and observations in notes

4.6.3.5 Interpretation of Results

It may be possible to determine the shot size and composition of the pellets. Record interpretation of results in notes.

4.7 Appropriate Appendices

Appendix A - Calibration Standards

Appendix C - Work Sheets

4.8 References

Association of Firearm and Toolmark Examiners Glossary, 3rd ed. 1994.

Howe, Walter, J. "Laboratory Work Sheets". AFTE NEWSLETTER NUMBER TWO. August 1969, p.13.

NRA Firearms Fact Book. National Rifle Association of America. 3rd ed. 1989.

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